APPENDIX I
GEOTECHNICAL REPORTS

Southern California Soil & Testing, Inc.
Update Letter Plan Review La Costa Town Square M.S. 04-8, Rancho Santa Fe Road and La Costa Avenue, Carlsbad, California.
January 6, 2009.

GeoSoils, Inc.
Review of DRAFT Tentative Map, La Costa Town Center - Commercial Area East of Rancho Santa Fe Road, APN 223-050-68 and 223-060-31, La Costa, City of Carlsbad, California.
February 21, 2000

GeoSoils, Inc.
Update Preliminary Geotechnical Report, La Costa Town Center, La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California.
October 20, 2000

GeoSoils, Inc.
Review of Development Plan, La Costa Town Center-Commercial Area South of Rancho Santa Fe Road, APN 223-050-68 & 70 and 223-060-31 & 32, La Costa, City of Carlsbad, California.
March 6, 2001

GeoSoils, Inc.
Review of Tentative Map for La Costa Town Center-Residential, APN 223-050-70 and 223-060-32, La Costa, City of Carlsbad, California.
March 6, 2001

SOUTHERN CALIFORNIA SOIL & TESTING, INC.

San Diego Office
PHONE (619) 280-4321
TOLL FREE (877) 215-4321
FAX (619) 280-4717
P.O. Box 600627
San Diego, CA 92160-0627
6280 Riverdale Street
San Diego, CA 92120
www.scst.com

Indio Office
PHONE (760) 775-5983
TOLL FREE (877) 215-4321
FAX (760) 775-8362
83-740 Citrus Avenue
Suite G
Indio, CA 92201-3438
www.scst.com

January 6, 2009

SCS&T No. 0511038
Report No. 12

Ms. Brenda Tworoger
Aspen Properties
8799 Balboa Avenue, Suite 270
San Diego, California 92123

Subject: UPDATE LETTER PLAN REVIEW
LA COSTA TOWN SQUARE
M.S. 04-08
RANCHO SANTA FE ROAD AND LA COSTA AVENUE
CARLSBAD, CALIFORNIA

Dear Ms. Tworoger:

In accordance with the request of Mr. Robert Ladwig, Southern California Soil and Testing, Inc., has prepared this update letter for the subject project. To facilitate our update we reviewed the referenced reports and revised plans for the proposed project.

It is our opinion that the recommendations contained in the referenced reports are still applicable and should be implemented.

Should you have any questions regarding this document or if we may be of further service, please contact our office at your convenience.

Respectfully Submitted,
SOUTHERN CALIFORNIA SOIL & TESTING, INC.

REGISTERED GEOLOGIST JOHN R. HIGH No. 1237 CERTIFIED ENGINEERING GEOLOGIST Exp. 11-30-2010 STATE OF CALIFORNIA

John R. High, CEG 1237
Engineering Geologist

REGISTERED PROFESSIONAL ENGINEER GARRETT B. FOUNTAIN No. 2752 Exp. 9-30-2010 GEOTECHNICAL STATE OF CALIFORNIA

Garrett Fountain, GE 2752
Geotechnical Engineer

JRH:GF:aw

(1) Addressee
(2) Ladwig Design Group – Attention: Mr. Robert Ladwig

RECEIVED
JAN 12 2009
LADWIG DESIGN GR

REFERENCES

1. "Tentative Map for La Costa Town Square Commercial", sheets 1-10, prepared by O'Day Consultants, dated December 8, 2008.

2. "Tentative Map for La Costa Town Square Office", sheets 1-4, prepared by O'Day Consultants, dated December 8, 2008.

3. "Geotechnical Summary, La Costa Town Square, Carlsbad Tract No. C.T. 01-09, Rancho Santa Fe Road and La Costa Avenue, Carlsbad, California" prepared by Southern California Soil and Testing, Inc.; dated April 23, 2007 (SCS&T No. 0511038-6).

4. "Update Letter, La Costa Town Square, Carlsbad Tract No. C.T. 01-09, Rancho Santa Fe Road and La Costa Avenue, Carlsbad, California"; prepared by Southern California Soil and Testing, Inc.; dated March 28, 2007 (SCS&T No. 0511038-4).

5. "Borrow Pit Stability Fill Recommendations, Las Costa Town Square, Carlsbad Tract No. C.T. 01-09, Rancho Santa Fe Road and La Costa Avenue, Carlsbad, California", prepared by Southern California Soil and Testing, Inc.; dated January 20, 2006 (SCS&T No. 0511038-3).

6. "Preliminary Findings, Agua Dulce Slope Failure and Pit Evaluation, La Costa Town Square, Carlsbad Tract No. C. T. 01-09, Rancho Santa Fe Road and La Costa Avenue, Carlsbad, California"; prepared by Southern California Soil and Testing, Inc.; dated July 20, 2005 (SCS&T No. 0511038-2).

7. "Updated Preliminary Geotechnical Investigation, La Costa Town Square, Carlsbad Tract No. C.T. 01-09, Rancho Santa Fe Road and La Costa Avenue, Carlsbad, California"; prepared by Southern California Soil and Testing, Inc.; dated April 8, 2005 (SCS&T No. 0511038-1).

GeoSoils, Inc.

Geotechnical • Geologic • Environmental

5741 Palmer Way • Carlsbad, California 92008 • (760) 438-3155 • FAX (760) 931-0915

February 21, 2000

W.O. 2938-A2-SC

Red Crow Properties, Inc.
1947 Camino Vida Roble, Suite 104
Carlsbad, California 92008

Attention: Mr. Bill Shirley

Subject: Review of DRAFT Tentative Map, La Costa Town Center-Commercial Area East of Rancho Santa Fe Road, APN 223-050-68 and 223-060-31, La Costa, City of Carlsbad, California

References:
1. "Tentative Map for La Costa Town Center," Sheets 1-5 of 5, Job No. 00-1025, DRAFT dated February 7, 2001, by O'Day Consultants.

2. "Update Preliminary Geotechnical Report, La Costa Town Center, La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California," W.O. 2938-A-SC, dated October 20, 2000, by GeoSoils, Inc.

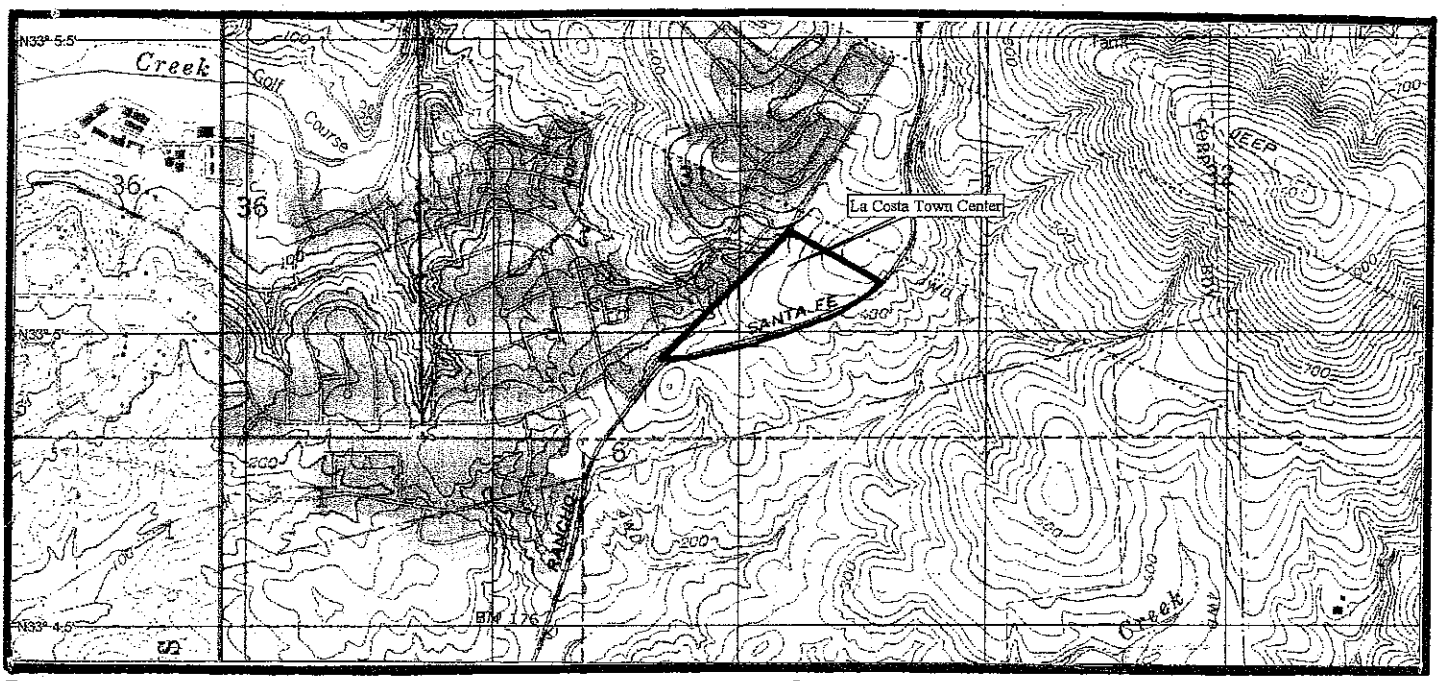
3. "Preliminary Geotechnical Study Update, Parcels S.E. 13, and 25 Acres Easterly of La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California," W.O. 1074-SD, dated June 6, 1990, by GeoSoils, Inc.

Dear Mr. Shirley:

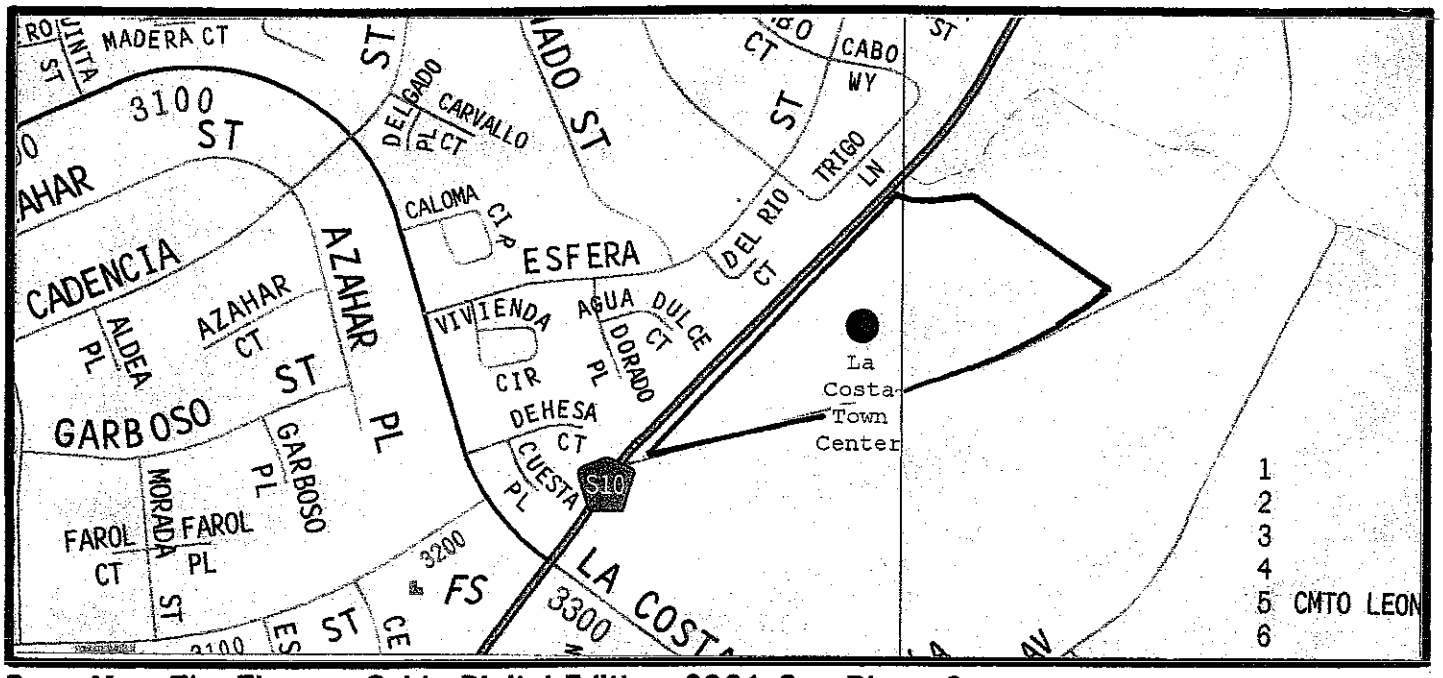
In accordance with the request of Mr. Bob Ladwig (Ladwig Design Group, Inc.) and your verbal authorization, GeoSoils, Inc. (GSI) has performed a review of the above referenced DRAFT tentative map of a portion of the La Costa Town Center. The purpose of our review was to evaluate existing site conditions relative to the proposed development and the onsite soils and geologic conditions from a geotechnical viewpoint. Unless specifically superceded in the text of this review, recommendations presented in the above referenced reports are considered valid and applicable.

Site Location

The subject, triangular-shaped commercial development is situated north and east of the intersection of La Costa Avenue and Rancho Santa Fe Road in the city of Carlsbad (Figure 1). The 14.7± acre property is bounded on the west by Rancho Santa Fe Road and on the east by the existing truck by-pass route for Rancho Santa Fe Road. The remaining portions of the planned La Costa Town Center development are located to the south and east.



Base Map: Rancho Santa Fe Quadrangle, California--San Diego Co., 7.5 Minute Series (Topographic), 1968 (photo revised, 1983), by USGS, 1"=2000'



Base Map: The Thomas Guide Digital Edition, 2001, San Diego County 1"=792'

N

GeoSoils, Inc.

W.O. 2938-A2-SC

SITE LOCATION MAP

Figure 1

Proposed Development

Based upon our review of the above referenced DRAFT tentative map, the proposed development would include realignment of Rancho Santa Fe Road to the southern boundary of the subject commercial parcel and construction of a connector road along the east boundary, with typical underground municipal utilities. Onsite improvements would include a relatively large commercial building situated along the southeastern edge of the parcel and parking lot areas located on the northerly, westerly, and easterly sides of the building. A relatively large sheet-graded pad would be developed in the northern corner of the parcel. A temporary and permanent desilting basin with storm drain connections are also planned. Background topography presented in the referenced plans indicates public roadways will be graded initially.

Based upon future elevations provided on the tentative map (O'Day, 2001), grading is planned to generate maximum cuts on the order of 30± feet (southeasterly portion of parcel). Graded cut slopes are planned at gradients of 2:1 (horizontal to vertical) of less. Maximum thickness of fills on the order of 30± feet (southwesterly portion of parcel). Graded fills slopes are planned at gradients of 2:1 (horizontal to vertical) of less.

It is anticipated that the commercial building(s) with be concrete tilt-up construction with standard continuous spread footings and column footings. Foundation loads are anticipated to be typical for this type of relatively light construction. Asphalt pavement with concrete curb, gutter and sidewalks are also anticipated.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on our review of the above referenced geotechnical reports and plans, it is our opinion that the project is feasible from a geologic and geotechnical viewpoint. The conclusions and recommendations contained in the referenced reports (by GSI) remain pertinent and applicable unless specifically superseded herein.

Bedrock underlying the majority of the parcel consists of volcanic/metavolcanic rock of the Santiago Peak Volcanics. Sandstone bedrock of the Delmar Formation underlies the southwesterly portion of the site. The initial rock hardness study (GSI, 1990) indicated that blasting will likely be necessary at depths on the order of 5± feet and greater in excavations exposing volcanic/metavolcanic bedrock. Excavations in the Delmar Formation can be achieved to the proposed depths with conventional heavy earth moving equipment.

Recommendations

Removals of existing earth materials considered unsuitable for support of settlement sensitive property improvements include topsoil, alluvium, and undocumented fill materials. Generally, removal depths are estimated to on the order of 1 to 3± feet.

Due to the anticipated rock hardness, consideration may be given to overexcavating street areas within hard rock cut areas to at least 12 inches below lowest utility invert elevation. Overexcavation within parkways may also be considered with respect to utility laterals; however, overexcavation for rock hardness is not a geotechnical requirement. Material generated from these areas would be blocky, and may be more difficult to handle. The need for blasting to achieve invert depths should be anticipated locally in existing cut areas.

It is anticipated that proposed earthwork over the majority of the parcel may require moderate to very difficult processing and/or excavation with heavy grading equipment, and blasting may not be locally precluded in shallow "cut" areas exposing hard rock. This depends not only on the size and hardness of rock materials, but on equipment types and operator's abilities and experience, as well as other lithologic characteristics. Oversize rock fragments (i.e., 12 inches or greater in one dimension) may be expected to be generated locally during onsite and offsite utility construction excavations, as well as during deeper onsite improvements (i.e., utilities).

EARTHWORK RECOMMENDATIONS

Site grading should be performed in accordance with the minimum standards of the City of Carlsbad, the Uniform Building Code (1997 edition) and the grading guidelines presented in the appendix of the above referenced report (GSI, 2000), except where specifically superseded herein. When code references are not equivalent, the more stringent code should be followed.

During earthwork construction, all site preparation and the general grading procedures of the contractor should be observed and the fill selectively tested by a representative(s) of GSI. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered. All applicable requirements of local and national construction and general industry safety orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met.

The preliminary engineering and geologic analyses performed, and the recommendations presented herein and in the referenced reports have been completed using the information provided. In the event that the information concerning proposed development is not correct, or any changes in site design are made, the conclusions and recommendations

contained in this report shall not be considered valid unless the changes are reviewed, and the recommendations presented herein are modified or approved in writing by this office.

From a geotechnical standpoint, the most primary geotechnical concern with respect to the proposed development is grading and disposal of volcanic/metavolcanic bedrock over the majority of the subject parcel. Preliminary recommendations are provided below.

Rock Excavation and Fill

1. As blasting becomes necessary, care should be taken in proximity to proposed cut slopes and existing structural areas, including existing municipal underground utilities. Over-blasting of hard rock would result in weakened rock conditions which could require remedial grading/construction to stabilize the utilities and/or affected cut slopes.

2. Decreasing shot-hole spacings can result in better quality fill materials which may otherwise require specialized burial techniques. If blasting is utilized it is recommended that generally minus 2-foot sized materials is produced and that sufficient fines (sands and gravel) to fill all void spaces are present. This procedure would facilitate fill placement and decrease the need to drill and shoot large rocks produced.

Rock Disposal

During the course of grading, materials generated are anticipated to be of varying dimensions. For the purpose of this review report, the materials may be described as either 12 inches or less, greater than 12 and less than 36 inches, and greater than 36 inches. These three categories set the basic dimensions for where and how the materials are to be placed. Rock disposal areas should be developed in the early stages of grading to allow for maximum usage.

Materials 8 Inches in Diameter or Less

Since rock fragments along with granular materials are a major part of the native materials used in the grading of the site, a criteria is needed to facilitate the placement of these materials within guidelines which would be workable during the rough grading, post-grading improvements, and serve as acceptable compacted fill.

1. Fines and rock fragments 8 inches or less in one dimension may be placed as compacted fill cap materials within the building pads, slopes, and street areas as described below. The rock fragments and fines should be brought to at least optimum moisture content and compacted to a minimum relative compaction of 90 percent of the laboratory standard.

The purpose for the 8-inch-diameter limits is to allow reasonable sized rock fragments into the fill under selected conditions (optimum moisture or above) surrounded with compacted fines. The 8-inch-diameter size also allows a greater volume of the rock fragments to be handled during grading, while staying in reasonable limits for later onsite excavation equipment (i.e., backhoes) to excavate footings and utility lines.

2. Fill materials 8 inches or less in one dimension should be placed (but not limited to) within the upper 5 feet of proposed fill pads, the upper 3 feet of overexcavated cut areas on cut/fill transition pads, and the entire street right-of-way width. Overexcavation is discussed later in this report.

Materials Greater Than 8 Inches and Less Than 36 Inches in Diameter

1. During the process of excavation, rock fragments or constituents larger than 8 inches in one dimension will be generated. These oversized materials, greater than 8 and less than 36 inches in one dimension, may be incorporated into the fills utilizing a series of rock blankets.

2. Each rock blanket should consist of rock fragments of approximately greater than 8 and less than 36 inches in one dimension along with sufficient fines generated from the proposed cuts and overburden materials generated from removal areas. The blankets should be limited to 24 to 36 inches in thickness and should be placed with granular fines which are flooded into and around the rock fragments effectively, to fill all voids.

3. Rock blankets should be restricted to areas which are at least 1 foot below the lowest utility invert within the street right-of-way, 5 feet below finish grade on the proposed fill lots, and a minimum of 15 horizontal feet from any fill slope surface.

4. Compaction may be achieved by utilizing wheel rolling methods with scrapers and water trucks, track-walking by bulldozers, and sheepsfoot tampers. Equipment traffic should be routed over each lift. Given the rocky nature of this material, sand cone and nuclear densometer testing methods are often found to be ineffective. Where such testing methods are infeasible, the most effective means to evaluate compaction efforts by the contractor would be to excavate test pits at random locations to check those factors pertinent to performance of rock fills; moisture content, gradation of rock fragments and matrix material and presence of any apparent void spaces.

5. Each rock blanket should be completed with its surface compacted prior to placement of any subsequent rock blanket or rock windrow.

Materials Greater Than 36 Inches in Diameter

1. Oversize rock greater than 36 inches in one dimension should be placed in single rock windrows. The windrows should be at least 15 feet or an equipment width apart, whichever is greatest.

2. The void spaces between rocks in windrows should be filled with the more granular soils by flooding them into place.

3. A minimum vertical distance of 3 feet between soil fill and rock windrow should be maintained. Also, the windrows should be staggered from lift to lift. Rock windrows should not be placed closer than 15 feet from the face of fill slopes.

4. Larger rocks too difficult to be placed into windrows may be individually placed into a dozer trench. Each trench should be excavated into the compacted fill or dense natural ground a minimum of 1 foot deeper than the size of the rock to be buried. After the rocks are placed in the trench (not immediately adjacent to each other), granular fill material should be flooded into the trench to fill the voids.

   The oversize rock trenches should be no closer together than 15 feet at a particular elevation and at least 15 feet from any slope face. Trenches at higher elevations should be staggered and there should be 4 feet of compacted fill between the top of one trench and the bottom of the next higher trench. Placement of rock into these trenches should be under the full-time inspection of the soils engineer.

5. Consideration should be given to using oversize materials in open space "green belt" areas that would be designated as non-structural fills.

Remedial Earthwork - Lot Capping and Cut/fill Transitions

General Guidelines

For more uniform foundation support conditions as well as to facilitate subdrainage, and utility placement, trenching and future improvements, building pad sites should be capped with a minimum 3-foot thick fill blanket utilizing low expansive materials. Rock fragments in the fill cap should be less than 8-inches in one dimension. Highly expansive materials (i.e., clayey derived fill materials) should not be placed within seven (7) feet of finish grade, if feasible.

Care should be taken to avoid placing expansive soils or oversized rocky materials within 3 feet of finish grade. Areas, where proposed fills are less than three (3) feet thick, should be overexcavated and/or reprocessed in order to provide the recommended minimum fill cap thickness. For uniform support, the cut portion of building pads should be overexcavated to a minimum depth of three (3) feet below proposed pad grade or 1/3(D),

where (D) is the maximum fill depth beneath the foundation system for the structure, whichever is greater. Once the overexcavation is completed, the exposed bottom should be scarified to a minimum depth of eight (8) inches (if feasible), moisture conditioned and compacted to a minimum 90 percent relative compaction. Overexcavations should be completed for a minimum lateral distance of 5 feet beyond the lot or below a 1:1 projection down and away from the exterior foundation elements to the elevation of suitable material, whichever is greater. To limit the potential for ponding beneath the fill cap, GSI also recommends that overexcavation occurs laterally beyond the building envelope boundary into the street section.

The subgrade surface between fill caps and the underlying dense bedrock should be designed to drain away from foundations at a one percent gradient toward streets and/or subdrains that exceed this depth. If not feasible, additional subdrainage may be needed. This should be further evaluated in the field during grading.

Should blasting be needed, it is important that the blasting procedures utilized produce predominantly 2-foot minus rock fragments. This should also generate smaller material (less than 8 inches). This would also generate some oversize material which would require special handling techniques for use in fills. This may be prudent to deal with during mass grading when large fill areas are easily accessible.

PLAN REVIEW

Project grading plans should be reviewed by this office as they become available. Based on our review, supplemental recommendations and further geotechnical studies specific to the proposed grading configuration(s) will likely be recommended. Further field work will require disturbance and removal of vegetation.

LIMITATIONS

The materials observed on the project site and the referenced reports reviewed are believed to be generally representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. site conditions may vary due to seasonal changes or other factors. GSI assumes no responsibility or liability for work, testing or recommendations performed or provided by others. The scope of work was performed within the limits of a budget. Inasmuch as our study is based upon the site materials observed, selective laboratory testing and engineering analysis, the conclusion and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to contact the undersigned at 760/438-3155.

Respectfully submitted,

GeoSoils, Inc.

Edward P. Lump
Engineering Geologist, CEG 1924

Reviewed by:

David W. Skelly
Civil Engineer, RCE 47857

EPL/JPF/DWS/mo

Distribution: (12) Addressee

GeoSoils, Inc.

Geotechnical • Geologic • Environmental

5741 Palmer Way • Carlsbad, California 92008 • (760) 438-3155 • FAX (760) 931-0915

October 20, 2000

W.O. 2938-A-SC

Red Crow Properties, Inc.
1947 Camino Vida Roble, Suite 104
Carlsbad, California 92008

Attention: Mr. Bill Shirley

Subject: Update Preliminary Geotechnical Report, La Costa Town Center, La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California

Reference: "Preliminary Geotechnical Study Update, Parcels S.E. 13, and 25 Acres Easterly of La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California," W.O. 1074-SD, dated June 6, 1990 by GeoSoils, Inc.

Dear Mr. Shirley:

In accordance with your request, GeoSoils, Inc. (GSI) has performed a geotechnical update of the subject site. The purpose of the study was to review existing site conditions relative to the proposed development and the onsite soils and geologic conditions from a geotechnical viewpoint. Unless specifically superceded in the text of this report, recommendations presented in the above referenced report are considered valid and applicable.

SCOPE OF SERVICES

The scope of our services has included the following:

1. Review of the above referenced report.

2. Geologic site reconnaissance.

3. General areal seismicity update evaluation.

4. Engineering and geologic analysis of data and preparation of this report.

SITE CONDITIONS/PROPOSED DEVELOPMENT

A site reconnaissance, performed by a representative from this office on September 21, 2000, indicated that site conditions have not substantially changed since the completion of the referenced report. Noted changes are related to underground utility placement along Rancho Santa Fe Road, which trends through the western portion of the property (Figure 1) It is our understanding that planned site development will consist of site preparation for the construction of single family residential structures and a commercial development. Foundation loads are anticipated to be typical for this type of relatively light construction. Sewage disposal is anticipated to be tied into the regional system.

FAULTING AND REGIONAL SEISMICITY

Faulting

The site is situated in a region of active as well as potentially-active faults. Our review indicates that there are no known active faults crossing the site within the areas proposed for development (Jennings, 1994), and the site is not within an Earthquake Fault Zone (Hart and Bryant, 1997).

There are a number of faults in the southern California area that are considered active and would have an effect on the site in the form of ground shaking, should they be the source of an earthquake (Figure 2). These faults include--but are not limited to--the San Andreas fault, the San Jacinto fault, the Elsinore fault, the Coronado Bank fault zone, and the Newport-Inglewood - Rose Canyon fault zone. The possibility of ground acceleration or shaking at the site may be considered as approximately similar to the southern California region as a whole.

The following table lists the major faults and fault zones in southern California that could have a significant effect on the site should they experience significant activity.

ABBREVIATED FAULT NAME	APPROXIMATE DISTANCE MILES (KM)
Coronado Bank-Agua Blanca	22 (75.4)
Elsinore	24 (38.6)
La Nación	17 (27.4)
Newport-Inglewood-Offshore	13 (20.9)
Rose Canyon	7 (11.3)
San Diego Trough-Bahia Sol.	33 (53.1)

Seismicity

The acceleration-attenuation relations of Joyner and Boore (1982), Campbell and Bozorgnia (1994), and Sadigh and others (1987) have been incorporated into EQFAULT (Blake, 1997). For this study, peak horizontal ground accelerations anticipated at the site were determined based on the random mean and mean plus 1 sigma attenuation curves developed by Joyner and Boore (1982), Campbell and Bozorgnia (1994), and Sadigh and others (1987). These acceleration-attenuation relations have been incorporated in EQFAULT, a computer program by Thomas F. Blake (1997), which performs deterministic seismic hazard analyses using up to 150 digitized California faults as earthquake sources. The program estimates the closest distance between each fault and the subject site. If a fault is found to be within a user-selected radius, the program estimates peak horizontal ground acceleration that may occur at the site from the upper bound ("maximum credible") and "maximum probable" earthquakes on that fault.

Site acceleration, as a percentage of the acceleration of gravity (g), is computed by any of the 14 user-selected acceleration-attenuation relations that are contained in EQFAULT. Based on the above, and using a radius of 100 miles for search, peak horizontal ground accelerations from an upper bound earthquake may be on the order of 0.480g to 0.561g. However, peak probable horizontal ground acceleration may be on the order of 0.279g to 0.314g.

Seismic Shaking Parameters

Based on the site conditions, Chapter 16 of the Uniform Building Code (International Conference of Building Officials, 1997), the following seismic parameters are provided.

Seismic zone (per Figure 16-2*)	4
Seismic Zone Factor (per Table 16-I*)	0.40
Soil Profile Type (per Table 16-J*)	S_B**, S_C***, S_D****
Seismic Coefficient C_a (per Table 16-Q*)	0.40 N_a, 0.40 N_a, 0.44 N_a
Seismic Coefficient C_v (per Table 16-R*)	0.40 N_v, 0.56 N_v, 0.64 N_v
Near Source Factor N_a (per Table 16-S*)	1.0
Near Source Factor N_v (per Table 16-T*)	1.0
Seismic Source Type (per Table 16-U*)	B
Distance to Seismic Source	7 mi. (11.2 km)
Upper Bound Earthquake	M_w 6.9

* Figure and table references from Chapter 16 of the Uniform Building Code (1997).
** S_B may be used for lots underlain by bedrock (Santiago Peak Volcanics)
*** S_C may be used for lots underlain by bedrock (Santiago Peak Volcanics), where fills are more than 10 feet below the bottom of the footings.
**** S_D may be used for lots underlain by formational sediments (Delmar/Lusardi Formations), or for lots where fills have been placed on formational sediments.

It should be noted that the parameters above are provided for the average soil properties for the top 100 feet of the soil profile. The S_B parameters are reasonably and conservatively justified for competent rock with moderate fracturing and weathering based on an estimated shear wave velocity (a "S" wave) of greater than 2,500 feet per second (fps) in the top 100 feet of the soil profile, as contrasted to the velocities used in our seismic refraction studies (a "P" wave). The estimated S wave velocities are about 0.58 of P wave velocities measured in our seismic refractions studies (Das, 1992; Hunt, 1986; and Griffiths and King, 1976). Accordingly, in accordance with the 1997 UBC, it is reasonably estimated that the shear wave velocity for the average soil profile of the top 100 feet of the soil profile exceeds 2,500 fps in granitic/volcanic bedrock.

EARTHWORK RECOMMENDATIONS

Site grading should be performed in accordance with the minimum standards of the City of Carlsbad, the Uniform Building Code (1997 edition) and the grading guidelines presented in the appendix. Due to the anticipated rock hardness, consideration should be given to overexcavating pad and street areas within hard rock cut areas to at least 12 inches below lowest utility invert elevation. Overexcavation within parkways should also be considered with respect to utility laterals. Overexcavation for rock hardness is not a geotechnical requirement.

FOUNDATION RECOMMENDATIONS

General

The foundation design and construction recommendations presented herein are preliminary in nature and will be finalized at the completion of grading. Recommendations for residential conventional foundation systems are provided in the following sections. The foundation systems may be used to support the proposed structures, provided they are founded in competent bearing material and should be designed and constructed in accordance with the guidelines contained in the Uniform Building Code. All footing designs should be reviewed by the project structural engineer. The use of conventional and/or post tensioned slab foundations will be determined in accordance with the criteria presented in the attached Table 1 and Table 2.

Conventional Foundation Design

1. Conventional spread and continuous footings may be used to support the proposed residential structures provided they are founded entirely in properly compacted fill or other competent bearing material (i.e., bedrock). Footings should not simultaneously bear directly on bedrock and fill soils.

2. Analyses indicate that an allowable bearing value of 1500 pounds per square foot may be used for design of continuous footings per Table 1, and for design of isolated pad footings 24 inches square and 18 inches deep into properly compacted fill or bedrock. The bearing value may be increased by one-third for seismic or other temporary loads. This value may be increased by 20 percent for each additional 12 inches in depth, to a maximum of 2500 pounds per square foot. No increase, in bearing, for footing width is recommended.

3. For lateral sliding resistance, a 0.35 coefficient of friction may be utilized for a concrete to soil contact when multiplied by the dead load.

4. Passive earth pressure may be computed as an equivalent fluid having a density of 200 pounds per cubic foot with a maximum earth pressure of 2500 pounds per square foot.

5. When combining passive pressure and frictional resistance, the passive pressure component should be reduced by one-third.

6. Footings should maintain a horizontal distance or setback between any adjacent slope face and the bottom outer edge of the footing. The horizontal distance may be calculated by using h/3, where (h) is the height of the slope. The horizontal setback should not be less than 7 feet, nor need to be greater than 40 feet (per code). The setback may be maintained by simply deepening the footings. Flatwork, utilities or other improvements within a zone of h/3 from the top of slope may be subject to lateral distortion. Footings, flatwork, and utilities setbacks should be constructed in accordance with distances indicated in this section, and/or the approved plans.

Conventional Foundation/Concrete Slab Construction

The following foundation construction recommendations are presented as a minimum criteria from a soils engineering standpoint. The onsite soils expansion potentials are generally in the very low to very high range, based on test results from the 1990 reference report. However, new soil samples should be collected and tested according to the current standards.

Recommendations by the project's design-structural engineer or architect, which may exceed the soils engineer's recommendations, should take precedence over the following minimum requirements. Final foundation design will be provided based on the expansion potential of the near surface soils encountered during grading, and/or depths at fills constructed.

Very Low to Low Expansive Soils (Expansion Index 0-50)

1. Exterior footings should be founded at a minimum depth of 12 inches for one story, and 18 inches below the lowest adjacent ground surface for two story residential structures. Interior footings may be founded at a depth of 12 inches below the lowest adjacent ground surface. All footings should be reinforced with two No. 4 reinforcing bars, one placed near the top and one placed near the bottom of the footing.

2. A grade beam, reinforced as above, and at least 12 inches wide should be provided across large (e.g. garage) entrances. The base of the grade beam should be at the same elevation as the bottom of adjoining footings.

3. Concrete slabs, where moisture condensation is undesirable, should be underlain by a vapor barrier consisting of a minimum of ten mil (or ten-mil for rocky fills) polyvinyl chloride or equivalent membrane with all laps sealed. This membrane should be laid over a minimum of two inches of sand and covered with a minimum of two inches of sand (total four inches) to aid in uniform curing of the concrete, and to protect the membrane from puncture.

4. Concrete slabs should be a minimum of 4 inches thick, and should be reinforced with No. 3 rebar at 18 inches on center, each way. All slab reinforcement should be supported to ensure placement near the vertical midpoint of the concrete. "Hooking" is not considered an acceptable method of positioning the reinforcement.

5. Garage slabs should be poured separately from the residence footings and quartered with expansion joints or saw cuts. A positive separation from the footings should be maintained with expansion joint material to permit relative movement.

6. Premoistening/presaturation is necessary for these soil conditions; however, the moisture content of the subgrade soils should be equal to or greater than optimum moisture to a depth of 12 inches below grade in the slab areas. Prior to placing visqueen or reinforcement, soil presaturation should be verified by this office within 72 hours of pouring slabs.

Medium Expansive Soils (Expansion Index 51-90)

1. Exterior footings should be founded at a minimum depth of 18 inches for both one- and two-story residential structures, below the lowest adjacent ground surface. Interior footings may be founded at a depth of 15 inches below the lowest adjacent ground surface. All footings should be reinforced with two No. 4 reinforcing bars, one placed near the top and two placed near the bottom of the footing. Isolated interior or exterior piers and columns are not recommended.

2. A grade beam, reinforced as above, and at least 12 inches wide by 18 inches deep should be provided across large (e.g. garage) entrances. The base of the grade beam should be at the same elevation as the bottom of adjoining footings.

3. Concrete slabs, where moisture condensation is undesirable, should be underlain by a vapor barrier consisting of a minimum of ten mil (or ten-mil for rocky fills) polyvinyl chloride or equivalent membrane with all laps sealed. This membrane should be laid over a minimum of two inches of sand and covered with a minimum of two inches of sand (total four inches) to aid in uniform curing of the concrete, and to protect the membrane from puncture.

4. Concrete slabs should be a minimum of 4 inches thick, and should be reinforced with No. 3 rebar at 18 inches on center, each way. All slab reinforcement should be supported to ensure placement near the vertical midpoint of the concrete. "Hooking" the wire mesh is not considered an acceptable method of positioning the reinforcement.

5. Garage slabs should be poured separately from the residence footings and quartered with expansion joints or saw cuts. A positive separation from the footings should be maintained with expansion joint material to permit relative movement.

6. Presaturation is recommended for these soil conditions. The moisture content of the subgrade soils should be equal to or greater than optimum moisture to a depth of 18 inches below grade in the slab areas. Prior to placing visqueen or reinforcement, soil presaturation should be verified by this office within 72 hours of pouring slabs.

Post-Tensioned Slab Foundation Systems

1. Post-tensioned (PT) slabs may be utilized for construction of typical one (1) and two (2) story residential structures onsite. The information and recommendations presented in this section are not meant to supersede design by a registered structural engineer or civil engineer familiar with post-tensioned slab design or corrosion engineering consultant.

2. From a soil expansion/shrinkage standpoint, a fairly common contributing factor to distress of structures using post-tensioned slabs is a significant fluctuation in the moisture content of soils underlying the perimeter of the slab, compared to the center, causing a "dishing" or "arching" of the slabs. To mitigate this possible phenomenon, a combination of soil presaturation (if necessary, or after the project has been dormant for a period of time) and construction of a perimeter "cut off" wall grade beam may be employed.

3. For very low to low (E.I.= 0 through 50) expansive soils, perimeter and mid span beams should be a minimum 12 inches deep below lowest adjacent pad grade. Perimeter beams should be a minimum of 18 inches deep for medium expansive and 24 inches deep for highly expansive soil conditions. The perimeter foundations may be integrated into the slab design or independent of the slab. The perimeter beams should be a minimum of 12 inches in width.

   A vapor barrier should be utilized and be of sufficient thickness to provide an adequate separation of foundation from soils (10-mil thick). The vapor barrier should be lapped and adequately sealed to provide a continuous water-resistant barrier under the entire slab. The vapor barrier should be sandwiched between two 2-inch thick layers of sand (SE>30) for a total of 4 inches of sand.

4. Isolated piers should not be incorporated into the post tension slab system.

5. Specific soil presaturation for slabs is not required for very low expansive soils; however, the moisture content of the subgrade soils should be at or above the soils' optimum moisture content to a minimum depth of 18 inches below grade depending on the footing embedment.

6. Post-tensioned slabs should be designed using sound engineering practice and be in accordance with the Post-Tension Institute (PTI), local and/or national code criteria and the recommendations of a structural or civil engineer qualified in post-tension slab design. Alternatives to PTI methodology may be used if equivalent systems can be proposed which accommodate the angular distortions, expansion parameters, and settlements noted for this project. If alternatives to PTI are suggested by the structural consultant, consideration should be given for additional review by a qualified structural PT-designer. Soil related parameters for post-tensioned slab design, are presented in Table 2.

7. Recommendations for the total and differential settlement will be provided when the project grading plans and (further geotechnical information) become available.

8. In accordance with guidelines presented in the Uniform Building Code, improvements and/or footings should maintain a horizontal distance, X, between any adjacent descending slope face and the bottom outer edge of the improvement

and/or footing. The horizontal distance, X, may be calculated by using X = h/3, where h is the height of the slope. X should not be less than 7 feet, nor need to be greater than 40 feet. X may be maintained by deepening the footings. Improvements constructed within a distance of h/3 from the top of slope may be subject to lateral distortion.

Foundations for any adjacent structures, including retaining walls, should be deepened (as necessary) to below a 1:1 projection upward and away from any proposed lower foundation system. This recommendation may not be considered valid, if the additional surcharge imparted by the upper foundation on the lower foundation has been incorporated into the design of the lower foundation.

Additional setbacks, not discussed or superseded herein, and presented in the UBC are considered valid.

CORROSION

Laboratory testing for soluble sulfates, pH, and corrosion to metals have not been completed. Based upon our experience in the site vicinity, however site materials may have a moderate to severe potential for corrosion to concrete (i.e., sulfate content) and a severely high potential for corrosion to exposed steel (i.e., saturated resistivity). Preliminary testing should be completed prior to grading.

Upon completion of grading, additional testing of soils (including import materials) is recommended prior to the construction of utilities and foundations. Further evaluation by a qualified corrosion engineer may be considered. Accordingly, the use of Type V concrete with a modified water/cement ratio cannot be precluded.

DEVELOPMENT CRITERIA

Landscape Maintenance and Planting

Water has been shown to weaken the inherent strength of soil and slope stability is significantly reduced by overly wet conditions. Positive surface drainage away from graded slopes should be maintained and only the amount of irrigation necessary to sustain plant life should be provided for planted slopes. Overwatering should be avoided.

Graded slopes constructed within and utilizing onsite materials would be erosive. Eroded debris may be minimized and surficial slope stability enhanced by establishing and maintaining a suitable vegetation cover soon after construction. Plants selected for landscaping should be light weight, deep rooted types which require little water and are capable of surviving the prevailing climate. Compaction to the face of fill slopes would

tend to minimize short term erosion until vegetation is established. In order to minimize erosion on a slope face, an erosion control fabric (i.e. jute matting) should be considered.

From a geotechnical standpoint leaching is not recommended for establishing landscaping. If the surface soils area processed for the purpose of adding amendments they should be recompacted to 95 percent relative compaction.

Additional Site Improvements

Recommendations for additional grading, exterior concrete flatwork design and construction, including driveways, can be provided upon request. If in the future, any additional improvements are planned for the site, recommendations concerning the geological or geotechnical aspects of design and construction of said improvements could be provided upon request.

Trenching

All footing trench excavations for structures and walls should be observed and approved by a representative of this office prior to placing reinforcement. Footing trench spoil and any excess soils generated from utility trench excavations should be compacted to a minimum relative compaction of 90 percent if not removed from the site. All excavations should be observed by one of our representatives and conform to CAL-OSHA and local safety codes. GSI does not consult in the area of safety engineers.

In addition, the potential for encountering hard spots during footing and utility trench excavations should be anticipated. If these concretions are encountered within the proposed footing trench, they should be removed, which could produce larger excavated areas within the footing or utility trenches.

Drainage

Positive site drainage should be maintained at all times. Drainage should not flow uncontrolled down any descending slope. Water should be directed away from foundations and not allowed to pond and/or seep into the ground. Pad drainage should be directed toward the street or other approved area. Roof gutters and down spouts should be considered to control roof drainage. Down spouts should outlet a minimum of 5 feet from the proposed structure or into a subsurface drainage system. We would recommend that any proposed open bottom planters adjacent to proposed structures be eliminated for a minimum distance of 10 feet. As an alternative, closed bottom type planters could be utilized. An outlet placed in the bottom of the planter, could be installed to direct drainage away from structures or any exterior concrete flatwork.

PLAN REVIEW

Project grading plans should be reviewed by this office as they become available. Based on our review, supplemental recommendations and further geotechnical studies specific to the proposed grading configuration(s) will likely be recommended. Further field work will require disturbance and removal of vegetation.

LIMITATIONS

The materials observed on the project site and the referenced reports reviewed are believed to be generally representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. site conditions may vary due to seasonal changes or other factors. GSI assumes no responsibility or liability for work, testing or recommendations performed or provided by others. The scope of work was performed within the limits of a budget. Inasmuch as our study is based upon the site materials observed, selective laboratory testing and engineering analysis, the conclusion and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to contact the undersigned at 760/438-3155.

Respectfully submitted,

GeoSoils, Inc.

Saady S. Farhan, Ph.D.
Project Engineer

Reviewed by:

Edward P. Lump
Engineering Geologist, CEG 1924

David W. Skelly
Civil Engineer, RCE 47857

SSF/EPL/JPF/DWS/sw

Attachments: Table 1 - Conventional Foundation Recommendations
Table 2 - Post Tensioned Foundation Recommendations
Appendix - References

Distribution: (4) Addressee

TABLE 1

Preliminary Conventional Perimeter Footings and Slab Recommendations for La Costa Town Square

FOUNDATION CATEGORY	MINIMUM FOOTING SIZE	INTERIOR SLAB THICKNESS	REINFORCING STEEL	INTERIOR SLAB REINFORCEMENT	UNDER-SLAB TREATMENT
I	12" Wide x 12" Deep	4 " Thick	1- #4 Bar Top and Bottom	#3 Bars @ 18" o.c. Both Directions	2" Sand Over 10-Mil Polyvinyl Membrane Over 2" Sand Base
II	12" Wide x 18" Deep	4 " Thick	2- #4 Bars Top and Bottom	#3 Bars @ 18" o.c. Both Directions	2" Sand Over 10-Mil Polyvinyl Membrane Over 2" Sand Base
III	Use Post-Tensioned Slab, see Table (2) for design parameters.				

Category Criteria

Category I: Max. Fill Thickness is less than 20' and Expansion Index is less than or equal to 50 and Differential Fill Thickness is less than 10' (see note 1).

Category II: Max. Fill Thickness is less than 50' and Expansion Index is less than or equal to 90 or Differential Fill Thickness is between 10 and 20' (see note 1).

Category III: Max. Fill Thickness exceeds 50', or Expansion Index exceeds 90 but is less than 130, or Differential Fill Thickness exceeds 20' (see note 1).

Notes:
1. Post tension (PT) foundations are required where maximum fill exceeds 50', or the ratio of the maximum fill thickness to the minimum fill thickness exceeds 3:1. Consideration should be given to using post tension foundations where the expansion index exceeds 90.
2. Footing depth measured from lowest adjacent subgrade.
3. Maximum allowable soil bearing pressure is 2,000 PSF (see notes of Table 2).
4. Concrete for slabs and footings shall have a minimum compressive strength of 2,000 PSI (2,500 PSI for exterior flatwork), or adopted UBC min., at 28 days, using 5 sacks of cement. Maximum Slump shall be 5".
5. Visqueen vapor barrier not required under garage slab. However, consideration should be given to future uses of the slab area, such as room conversion and/or storage of moisture-sensitive materials.
6. Isolated footings shall be connected to foundations with grade beams.
7. Sand used for base under slabs shall be very low expansive, and have SE > 30.
8. All slabs should be provided with weakened plane joints to control cracking. Joint spacing should be in accordance with correct industry standards and reviewed by the project structural engineer.

TABLE 2

PRELIMINARY POST TENSION SLAB FOUNDATION RECOMMENDATIONS, LA COSTA TOWN SQUARE

Expansion Index	Foundation Category*		
	I (PT) Very Low to Low (0-50)	II (PT) Medium (51-90)	III (PT) High (>90)
Perimeter footing embedment	12"	18" (w/premoistening)	(24" (w/premoistening)
Allowable bearing value	1200 psf**	1200 psf**	1200 psf**
Modulus of subgrade reaction	100 pci/inch	75 pci/inch	75 pci/inch
Coefficient of friction	0.35	0.35	0.35
Passive pressure	200 pcf	200 pcf	200 pcf
Soil suction (Pf)	3.6	3.6	3.6
Depth to constant soil suction	5 feet	5 feet	5 feet
Thornthwaite moisture index	-20.0 inches/year	-20.0 inches/year	-20.0 inches/year
e_m edge	2.5 feet	2.7 feet	3.0 feet
e_m center	5.0 feet	5.5 feet	5.5 feet
y_m edge	0.35 inches	0.5 inches	0.75 inches
y_m center	1.1 inches	2.0 inches	2.5 inches

*Preliminary values for differential settlement are included in the text of this report.
**Internal bearing values within the perimeter of the Post-tension slab may be increased by 20 percent for each additional foot of embedment (beyond 6" surface subgrade for perimeter footings adjacent to landscape areas) to a maximum value of 2500 psf.

APPENDIX

REFERENCES

Blake, Thomas F., 1997, EQFAULT computer program and users manual for the deterministic prediction of horizontal accelerations from digitized California faults.

Campbell, K.W. and Bozorognia, Y. 1994, "Near-Source Attenuation of Peak Horizontal Acceleration from Worldwide Accelerograms Recorded from 1857 to 1993," Proceedings, Fifth U.S. National Conference on Earthquake Engineering, Vol. III , Earthquake Engineering Research Institute, pp. 283-292.

Das, B.M., 1993, Principles of soil dynamics, published by PWS-Kent Publishing Company.

Greensfelder, R. W., 1974, Maximum credible rock acceleration from earthquakes in California: California Division of Mines and Geology, Map Sheet 23.

Griffiths, D.H. and King, R.F., reprinted 1976, Applied geophysics for engineers and geologists, published by Pergamon Press.

Hart, E. W. and Bryant W.A., 1997, Fault rupture hazard zones in California, Alquist-Priolo earthquake fault zoning act with index to earthquake fault zone maps, California Division of Mines and Geology, Special Publication 42, undated.

Housner, G. W., 1970, Strong ground motion in Earthquake Engineering, Robert Wiegel, ed., Prentice-Hall.

Hunt, R.E., 1986, Geotechnical engineering analysis and evaluation, published by McGraw-Hill Book Company.

Idriss, I. M. 1994, Attenuation Coefficients for Deep and Soft Soil Conditions, personal communication.

International Conference of Building Officials, 1997, Uniform building code: Whittier, California.

GeoSoils, Inc.

Geotechnical • Geologic • Environmental

5741 Palmer Way • Carlsbad, California 92008 • (760) 438-3155 • FAX (760) 931-0915

March 6, 2001

W.O. 2938-A2-SC

La Costa Town Center, LLC
5355 Avenida Encinas, Suite 209
Carlsbad, California 92008

Attention: Mr. Bill Shirley

Subject: Review of Tentative Map for La Costa Town Center-Residential, APN 223-050-70 and 223-060-32, La Costa, City of Carlsbad, California

References:
1. "Tentative Map for La Costa Town Center Residential," Sheets 1-6 of 6, Job No. 00-1025, dated February 24, 2001, by O'Day Consultants.

2. "Update Preliminary Geotechnical Report, La Costa Town Center, La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California," W.O. 2938-A-SC, dated October 20, 2000, by GeoSoils, Inc.

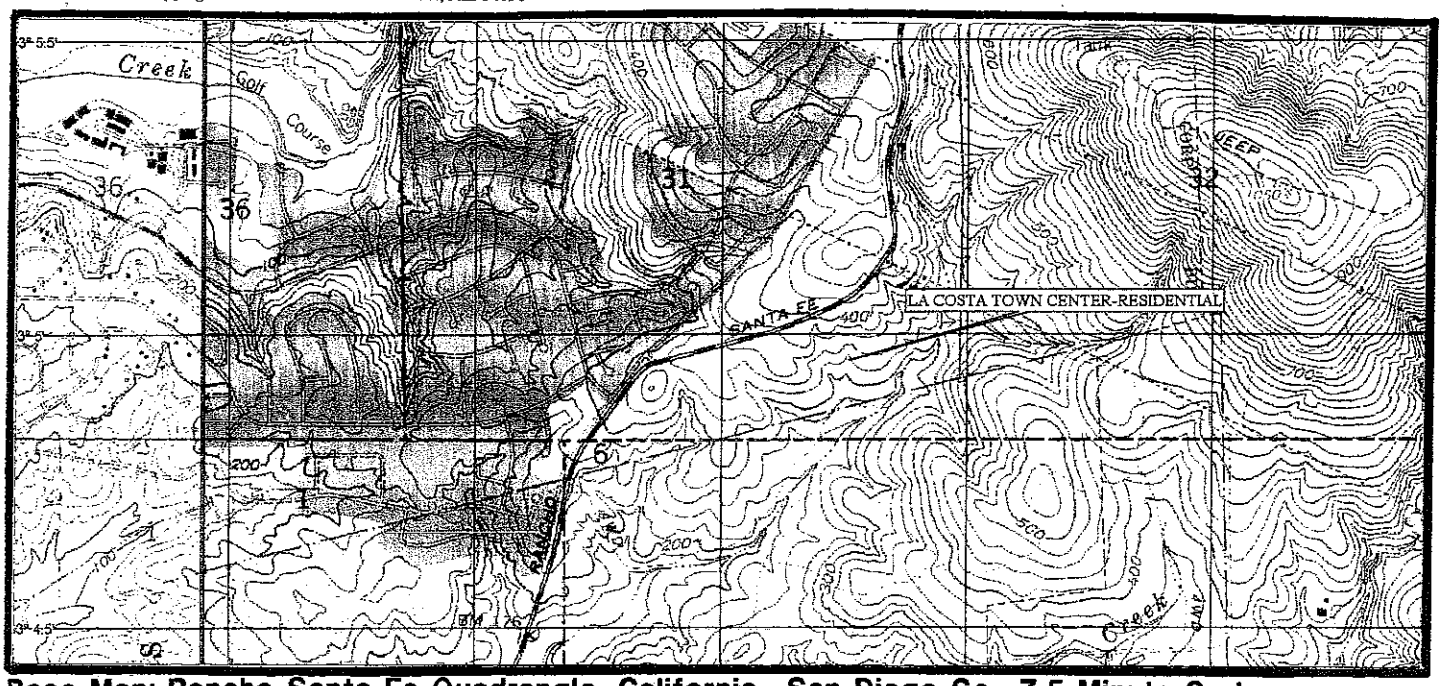
3. "Preliminary Geotechnical Study Update, Parcels S.E. 13, and 25 Acres Easterly of La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California," W.O. 1074-SD, dated June 6, 1990, by GeoSoils, Inc.

Dear Mr. Shirley:

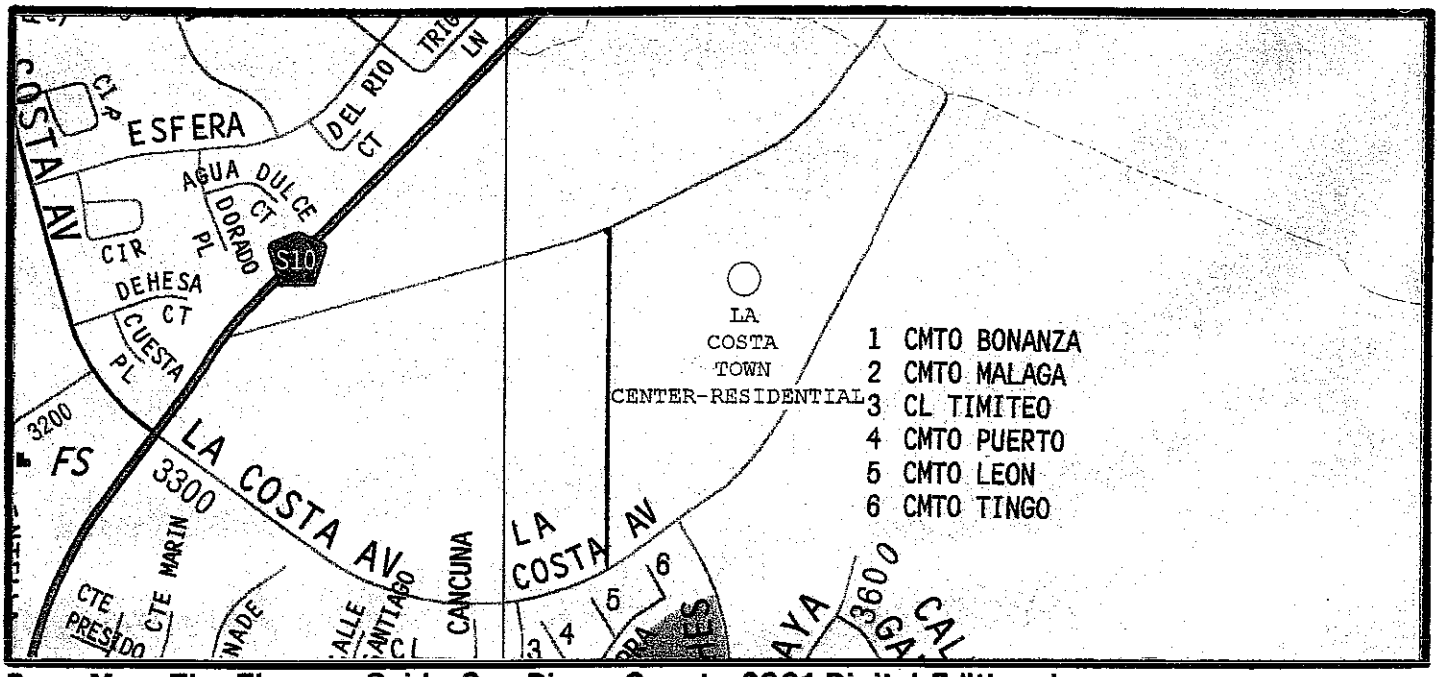
In accordance with the request of Mr. Bob Ladwig (Ladwig Design Group, Inc.) and your verbal authorization, GeoSoils, Inc. (GSI) has performed a review of the above referenced tentative map for the residential portion of La Costa Town Center. The purpose of our review was to evaluate existing site conditions relative to the proposed development and the onsite soils and geologic conditions from a geotechnical viewpoint. Unless specifically superceded in the text of this review, recommendations presented in the above referenced reports are considered valid and applicable. Preliminary foundation design recommendations provided in the above referenced report (GSI, 2000) remain pertinent and applicable to the subject project, and, therefore, not included herein.

SITE LOCATION

The subject residential portion of the La Costa Town Center development is situated east of the intersection of La Costa Avenue and Rancho Santa Fe Road in the city of Carlsbad (Figure 1).



Base Map: Rancho Santa Fe Quadrangle, California--San Diego Co., 7.5 Minute Series (Topographic), 1968 (photorevised 1983), USGS, 1"=2000'



Base Map: The Thomas Guide San Diego County 2001 Digital Edition, by Thomas Bros. Maps, 1"=792'

GeoSoils, Inc.

W.O. 2938-A2-SC

SITE LOCATION MAP

Figure 1

The 24± acre project is bounded on the west by the future southern commercial portion of La Costa Town Center, on the north by the existing truck by-pass route for Rancho Santa Fe Road, on the south by La Costa Avenue and undeveloped land, and on the east by a San Diego Gas and Electric (SDG&E) easement with transmission towers.

PROPOSED DEVELOPMENT

Our review of the above referenced tentative map indicates the realignment of Rancho Santa Fe Road along the northern boundary of the subject parcel is to be completed, with typical underground municipal utilities. Typical cut and fill grading operations would generate lots for 64, single-family residences (Lots 1-64), 3 open space lots (Lots 65-67), and interior roadways with underground municipal utilities. A detention basin is proposed in the southwestern corner of the project (i.e., Open Space Lot 67), above La Costa Avenue. La Costa Avenue is to be extended roughly 600± feet to the east. The plans indicate that a water line easement exists along the southeasterly project boundary.

Based upon future elevations provided on the development plan (O'Day, 2001), grading is planned to generate maximum cut depths on the order of 40± feet (Lot 42). on the order of 30± feet in height. Graded cut slopes, on the order of 30± feet in maximum height, are planned at gradients of 2:1 (horizontal to vertical) or less. Maximum thickness of fills are planned on the order of 50± feet (detention basin). Graded fill slopes, on the order of 40± feet in maximum height, are planned at gradients of 2:1 (horizontal to vertical) or less.

It is our understanding that residential buildings will use continuous footings and slab-on-grade floors with wood-frame and/or masonry block construction. Building loads are assumed to be typical for this type of relatively light structure. It is also our understanding that sewage disposal is proposed to be accommodated by tying into the regional municipal system. The need for import fill materials, from other portions of the development as a whole is anticipated.

EARTH MATERIALS

Bedrock underlying the majority of the parcel consists of volcanic/metavolcanic rock of the Santiago Peak Volcanics. The initial rock hardness study (GSI, 1990) indicated that blasting will likely be necessary at depths on the order of 2-5± feet in excavations exposing volcanic/metavolcanic bedrock. Sedimentary bedrock (i.e., claystone with rock fragments) of the Lusardi Formation locally underlies a canyon and lower natural slope area in the southeasterly portion of the site (i.e., Lots 61± - 64±). Excavations in the Lusardi Formation can be achieved to the proposed depths with conventional heavy earth moving equipment.

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on our review of the above referenced geotechnical reports and plans, it is our opinion that the project is feasible from a geologic and geotechnical viewpoint. The conclusions and recommendations contained in the referenced reports (by GSI) remain pertinent and applicable unless specifically superseded herein.

From a geotechnical standpoint, the most primary geotechnical concern with respect to the proposed development is grading and disposal of volcanic/metavolcanic bedrock over the majority of the subject parcel. Preliminary recommendations are provided below.

Recommendations

Removals of existing earth materials considered unsuitable for support of settlement sensitive property improvements include topsoil, alluvium, and highly weathered/decomposed portions of the underlying bedrock materials. Generally, removal depths are estimated to on the order of 1 to 3± feet, except within canyon areas were alluvial removals are anticipated to be on the order 3 to 9± feet.

Due to the anticipated rock hardness, consideration may be given to overexcavating street areas within hard rock cut areas to at least 12 inches below lowest utility invert elevation. Overexcavation within parkways may also be considered with respect to utility laterals; however, overexcavation for rock hardness is not a geotechnical requirement. Material generated from these areas would be blocky, and may be more difficult to handle. The need for blasting to achieve invert depths should be anticipated in existing cut areas. Developing cut areas initially should to considered to maximum onsite areas of rock disposal.

It is anticipated that proposed earthwork over the majority of the parcel may require moderate to very difficult processing and/or excavation with heavy grading equipment, and blasting may not be precluded in shallow "cut" areas exposing hard rock. This depends not only on the size and hardness of rock materials, but on equipment types and operator's abilities and experience, as well as other lithologic characteristics. Oversize rock fragments (i.e., 12 inches or greater in one dimension) may be expected to be generated locally during onsite and offsite utility construction excavations, as well as during deeper onsite improvements (i.e., utilities).

EARTHWORK RECOMMENDATIONS

Site grading should be performed in accordance with the minimum standards of the City of Carlsbad, the Uniform Building Code (latest edition) and the grading guidelines

presented in the appendix of the above referenced report (GSI, 2000), except where specifically superseded herein. When code references are not equivalent, the more stringent code should be followed.

During earthwork construction, all site preparation and the general grading procedures of the contractor should be observed and the fill selectively tested by a representative(s) of GSI. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered. All applicable requirements of local and national construction and general industry safety orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met.

The preliminary engineering and geologic analyses performed, and the recommendations presented herein and in the referenced reports have been completed using the information provided. In the event that the information concerning proposed development is not correct, or any changes in site design are made, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the recommendations presented herein are modified or approved in writing by this office.

Rock Excavation and Fill

1. As blasting becomes necessary, care should be taken in proximity to proposed cut slopes and existing structural areas, including existing municipal underground utilities. Over-blasting of hard rock would result in weakened rock conditions which could require remedial grading/construction to stabilize the utilities and/or affected cut slopes.

2. Decreasing shot-hole spacings can result in better quality fill materials which may otherwise require specialized burial techniques. If blasting is utilized it is recommended that generally minus 2-foot sized materials is produced and that sufficient fines (sands and gravel) to fill all void spaces are present. This procedure would facilitate fill placement and decrease the need to drill and shoot large rocks produced.

Rock Disposal

During the course of grading, materials generated are anticipated to be of varying dimensions. For the purpose of this review report, the materials may be described as either 8 inches or less, greater than 8 and less than 36 inches, and greater than 36 inches. These three categories set the basic dimensions for where and how the materials are to be placed. Rock disposal areas should be developed in the early stages of grading to allow for maximum usage.

Materials 8 Inches in Diameter or Less

Since rock fragments along with granular materials are a major part of the native materials used in the grading of the site, a criteria is needed to facilitate the placement of these materials within guidelines which would be workable during the rough grading, post-grading improvements, and serve as acceptable compacted fill.

1. Fines and rock fragments 8 inches or less in one dimension may be placed as compacted fill cap materials within the building pads, slopes, and street areas as described below. The rock fragments and fines should be brought to at least optimum moisture content and compacted to a minimum relative compaction of 90 percent of the laboratory standard.

   The purpose for the 8-inch-diameter limits is to allow reasonable sized rock fragments into the fill under selected conditions (optimum moisture or above) surrounded with compacted fines. The 8-inch-diameter size also allows a greater volume of the rock fragments to be handled during grading, while staying in reasonable limits for later onsite excavation equipment (i.e., backhoes) to excavate footings and utility lines.

2. Fill materials 8 inches or less in one dimension should be placed (but not limited to) within the upper 3 feet of proposed fill pads, the upper 3 feet of overexcavated cut areas on cut/fill transition pads, and the entire street right-of-way width. Over excavation is discussed later in this report.

Materials Greater Than 8 Inches and Less Than 36 Inches in Diameter

1. During the process of excavation, rock fragments or constituents larger than 8 inches in one dimension will be generated. These oversized materials, greater than 8 and less than 36 inches in one dimension, may be incorporated into the fills utilizing a series of rock blankets.

2. Each rock blanket should consist of rock fragments of approximately greater than 8 and less than 36 inches in one dimension along with sufficient fines generated from the proposed cuts and overburden materials generated from removal areas. The blankets should be limited to 24 to 36 inches in thickness and should be placed with granular fines which are flooded into and around the rock fragments effectively, to fill all voids.

3. Rock blankets should be restricted to areas which are at least 1 foot below the lowest utility invert within the street right-of-way, 5 feet below finish grade on the proposed fill lots, and a minimum of 15 horizontal feet from any fill slope surface.

4. Compaction may be achieved by utilizing wheel rolling methods with scrapers and water trucks, track-walking by bulldozers, and sheepsfoot tampers. Equipment traffic should be routed over each lift. Given the rocky nature of this material, sand cone and nuclear densometer testing methods are often found to be ineffective. Where such testing methods are infeasible, the most effective means to evaluate compaction efforts by the contractor would be to excavate test pits at random locations to check those factors pertinent to performance of rock fills; moisture content, gradation of rock fragments and matrix material and presence of any apparent void spaces.

5. Each rock blanket should be completed with its surface compacted prior to placement of any subsequent rock blanket or rock windrow.

Materials Greater Than 36 Inches in Diameter

1. Oversize rock greater than 36 inches in one dimension should be placed in single rock windrows. The windrows should be at least 15 feet or an equipment width apart, whichever is greatest.

2. The void spaces between rocks in windrows should be filled with the more granular soils by flooding them into place.

3. A minimum vertical distance of 3 feet between soil fill and rock windrow should be maintained. Also, the windrows should be staggered from lift to lift. Rock windrows should not be placed closer than 15 feet from the face of fill slopes.

4. Larger rocks too difficult to be placed into windrows may be individually placed into a dozer trench. Each trench should be excavated into the compacted fill or dense natural ground a minimum of 1 foot deeper than the size of the rock to be buried. After the rocks are placed in the trench (not immediately adjacent to each other), granular fill material should be flooded into the trench to fill the voids.

   The oversize rock trenches should be no closer together than 15 feet at a particular elevation and at least 15 feet from any slope face. Trenches at higher elevations should be staggered and there should be 4 feet of compacted fill between the top of one trench and the bottom of the next higher trench. Placement of rock into these trenches should be under the full-time inspection of the soils engineer.

5. Consideration should be given to using oversize materials in open space "green belt" areas that would be designated as non-structural fills.

Remedial Earthwork - Lot Capping and Cut/fill Transitions

General Guidelines

For more uniform foundation support conditions as well as to facilitate subdrainage, and utility placement, trenching and future improvements, building pad sites should be capped with a minimum 3-foot thick fill blanket utilizing low expansive materials. Rock fragments in the fill cap should be less than 8-inches in one dimension. Highly expansive materials (i.e., clayey derived fill materials) should not be placed within seven (7) feet of finish grade, if feasible.

Care should be taken to avoid placing expansive soils or oversized rocky materials within 3 feet of finish grade. Areas, where proposed fills are less than three (3) feet thick, should be over excavated and/or reprocessed in order to provide the recommended minimum fill cap thickness. For uniform support, the cut portion of building pads should be overexcavated to a minimum depth of three (3) feet below proposed pad grade or ⅓(D), where (D) is the maximum fill depth beneath the foundation system for the structure, whichever is greater. Once the overexcavation is completed, the exposed bottom should be scarified to a minimum depth of eight (8) inches (if feasible), moisture conditioned and compacted to a minimum 90 percent relative compaction. Overexcavation should be completed for a minimum lateral distance of 5 feet beyond the lot or below a 1:1 projection down and away from the exterior foundation elements to the elevation of suitable material, whichever is greater. To limit the potential for ponding beneath the fill cap, GSI also recommends that overexcavation occurs laterally beyond the building envelope boundary into the street section.

The subgrade surface between fill caps and the underlying dense bedrock should be designed to drain away from foundations at a one percent gradient toward streets and/or subdrains that exceed this depth. If not feasible, additional subdrainage may be needed. This should be further evaluated in the field during grading.

Should blasting be needed, it is important that the blasting procedures utilized produce predominantly 2-foot minus rock fragments. This should also generate smaller material (less than 8 inches). This would also generate some oversize material which would require special handling techniques for use in fills. This may be prudent to deal with during mass grading when large fill areas are easily accessible.

GRADED SLOPES

Fill Slopes

The largest proposed fill slope is approximately 50± feet high and planned at a gradient of 2:1. This slope is to be constructed along the western edge of the detention basin.

Typical keyways for interior slopes less than 20 feet in height are anticipated to be on the order of 12± feet wide and 2 feet in depth, when excavated into volcanic rock. Keyways for fill slopes along the exterior edges of Lots 61± through 64± may encounter a thin section of the Lusardi Formation overlying volcanic bedrock. Keyways should be extended through the clayston bedrock and at least 2 feet into competent volcanic bedrock. Perimeter slope keys exposing volcanic rock are anticipated to be 15± feet wide and a minimum of 3 feet into dense bedrock. Typical stabilization type backdrains may be recommended for all perimeter fill slope keys.

Cut Slopes

Cut slopes are designed at gradients of 2:1 or flatter. The highest cut slope is approximately 30± foot high, situated between Rancho Santa Fe Road and Lots 43 to 50±.

Cut slopes exposing the contact between sedimentary and volcanic bedrock will likely require stabilization. Typically, stabilization fills should be a consistent width of at least 15 feet from top to bottom. Stabilization fills should be provided with backdrainage as presented in the referenced report (GSI, 2000).

Cut slopes exposing volcanic bedrock are not anticipated to require buttressing or stabilization, unless continuous fractures or shears are encountered. Also, overblasting can weaken the rock material, necessitating stabilization.

All cut slopes should be mapped by a geologist from this office during grading to allow for amendments to recommendations, should exposed conditions warrant alteration of the design on stabilization.

Subdrainage

Placement of subdrains should be evaluated during grading; however, subdrains should be anticipated in all canyon cleanouts and stabilization/buttress fill slopes exceeding 8 feet in height prior to placing fill. Drains may also be considered in all perimeter fill slope keyways. All drains should be observed by a geologist from this office during grading to allow for amendments to recommendations, should exposed conditions warrant alteration of the design on stabilization.

Detention/Desilting Basins

Review of the mass grading plans indicates that a basin will be constructed on the southwestern site boundary, with fill slopes on the order of 30 to 40± feet in height. It is our understanding that this basin is a permanent structure. We recommend, therefore, that the detention/desilting basin be lined with either concrete or other impermeable material to hinder the migration of water in the subsurface and to decrease the potential for erosion.

PLAN REVIEW

Project grading plans should be reviewed by this office as they become available. Based on our review, supplemental recommendations and further geotechnical studies specific to the proposed grading configuration(s) will likely be recommended. Further field work may be recommended.

LIMITATIONS

The materials observed on the project site and the referenced reports reviewed are believed to be generally representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. site conditions may vary due to seasonal changes or other factors. GSI assumes no responsibility or liability for work, testing or recommendations performed or provided by others. The scope of work was performed within the limits of a budget. Inasmuch as our study is based upon the site materials observed, selective laboratory testing and engineering analysis, the conclusion and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time.

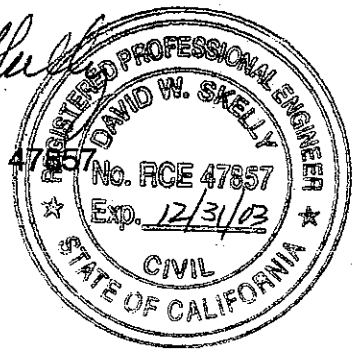
The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to contact the undersigned at 760/438-3155.

Respectfully submitted,

GeoSoils, Inc.

Edward P. Lump
Engineering Geologist, CEG 1924

Reviewed by:



David W. Skelly
Civil Engineer, RCE 47857

EPL/JPF/DWS/mo

Distribution: (12) Addressee

GeoSoils, Inc.

Geotechnical • Geologic • Environmental

5741 Palmer Way • Carlsbad, California 92008 • (760) 438-3155 • FAX (760) 931-0915

March 6, 2001

W.O. 2938-A2-SC

La Costa Town Center, LLC
5355 Avenida Encinas, Suite 209
Carlsbad, California 92008

Attention: Mr. Bill Shirley

Subject: Review of Site Development Plan, La Costa Town Center-Commercial Area South of Rancho Santa Fe Road, APN 223-050-68 & 70 and 223-060-31& 32, La Costa, City of Carlsbad, California

References:

1. "Site Development Plan for La Costa Town Center," Sheets 1-6 of 6, Job No. 00-1025, dated February 24, 2001, by O'Day Consultants.

2. "Review of DRAFT Tentative Map, La Costa Town Center-Commercial Area East of Rancho Santa Fe Road, APN 223-050-68 and 223-060-31, La Costa, City of Carlsbad, California," W.O. 2938-A2-SC, dated February 21, 2001, by GeoSoils, Inc.

3. "Update Preliminary Geotechnical Report, La Costa Town Center, La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California," W.O. 2938-A-SC, dated October 20, 2000, by GeoSoils, Inc.

4. "Preliminary Geotechnical Study Update, Parcels S.E. 13, and 25 Acres Easterly of La Costa Avenue and Rancho Santa Fe Road, La Costa, City of Carlsbad, California," W.O. 1074-SD, dated June 6, 1990, by GeoSoils, Inc.

Dear Mr. Shirley:

In accordance with the request of Mr. Bob Ladwig (Ladwig Design Group, Inc.) and your verbal authorization, GeoSoils, Inc. (GSI) has performed a review of the above referenced Site Development Plan for the southern, commercial portion of La Costa Town Center. The purpose of our review was to evaluate existing site conditions relative to the proposed development and the onsite soils and geologic conditions from a geotechnical viewpoint. Unless specifically superceded in the text of this review, recommendations presented in the above referenced reports are considered valid and applicable. Preliminary foundation design recommendations provided in the above referenced report (GSI, 2000) remain pertinent and applicable to the subject project, and therefore, are not included herein.

SITE LOCATION

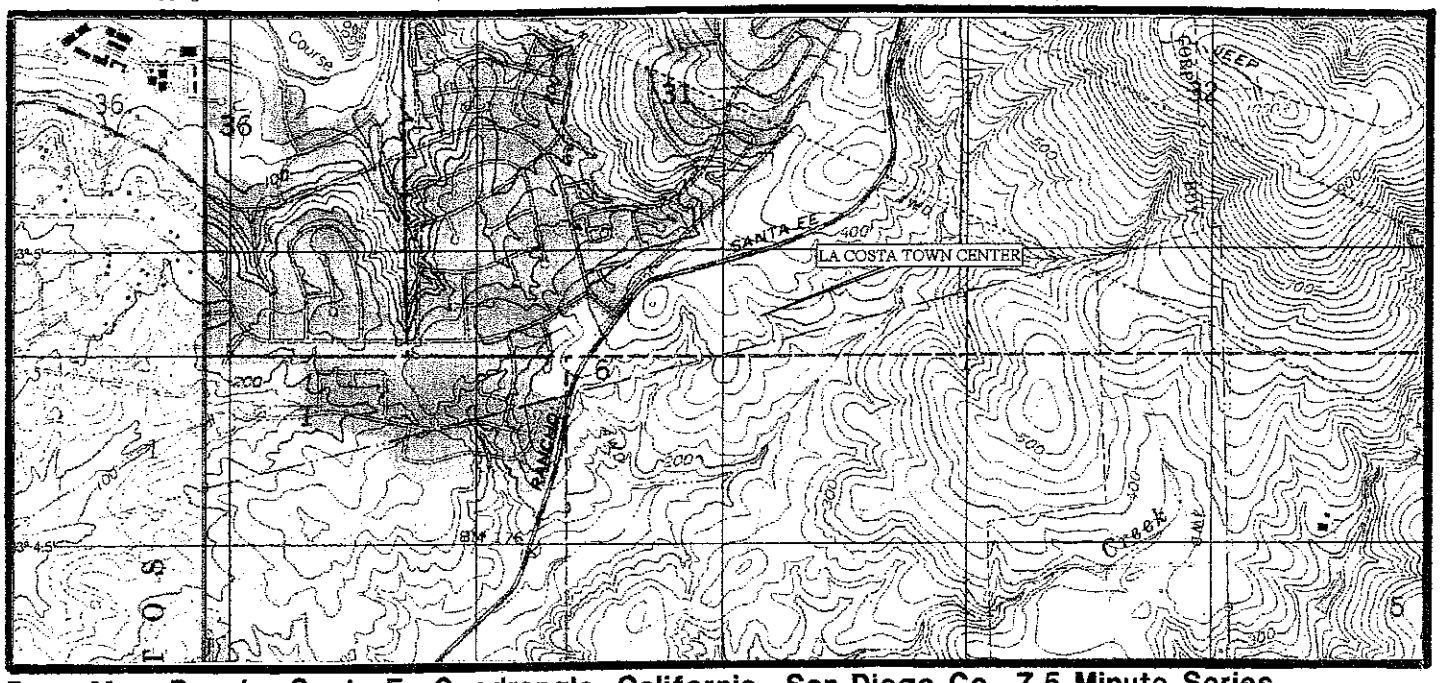
The subject, triangular-shaped commercial development is situated south and east of the intersection of La Costa Avenue and Rancho Santa Fe Road in the city of Carlsbad (Figure 1). The 48.1± acre property is bounded on the west by Rancho Santa Fe Road, on the north by the existing truck by-pass route for Rancho Santa Fe Road and the future northern commercial portion of La Costa Town Center, on the south by La Costa Avenue, and on the east by undeveloped land consisting of the future residential portion of La Costa Town Center. Elevations onsite range from 380± feet Mean Sea Level (MSL) in the northern portion of the site to roughly 265± feet MSL in the canyon east of the La Costa Avenue entrance.

PROPOSED DEVELOPMENT

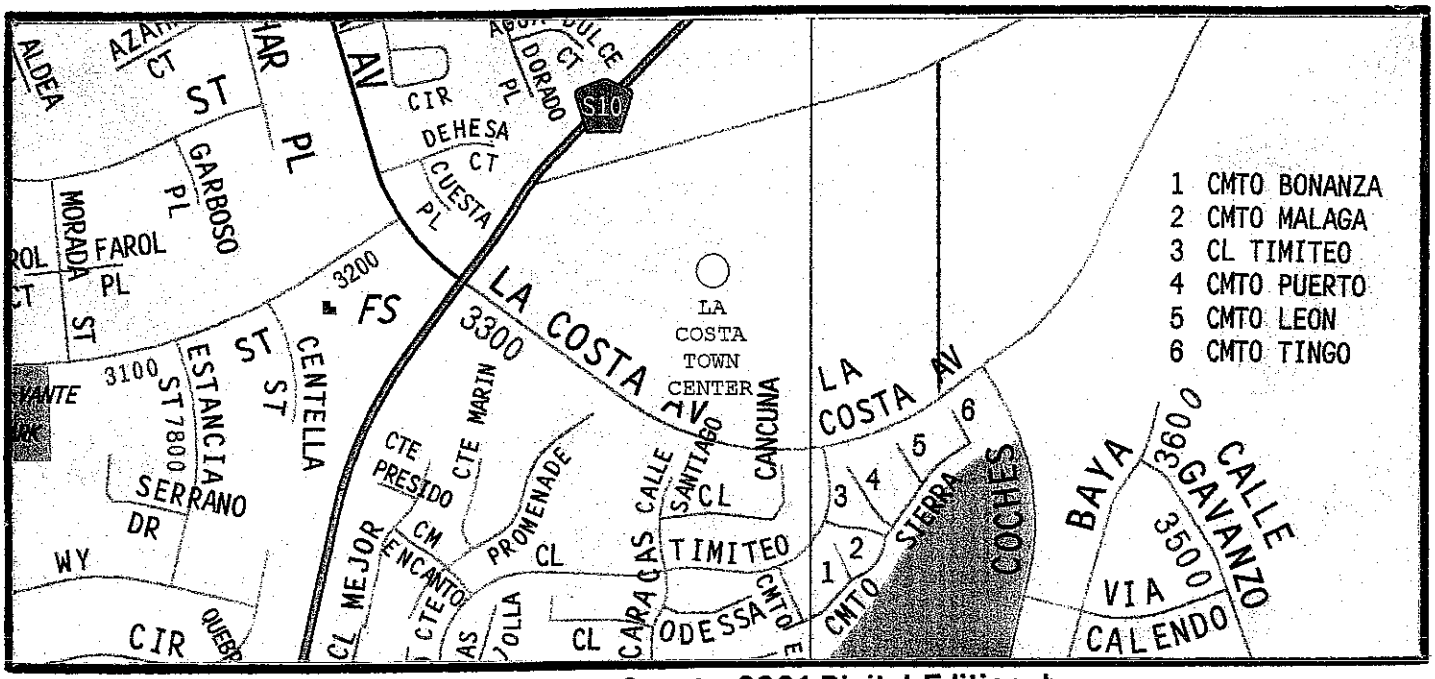
Our review of the above referenced site development plans indicates the realignment of Rancho Santa Fe Road along the northern boundary of the subject parcel is to be completed, with typical underground municipal utilities. Onsite improvements would include two, relatively large, multi-level commercial buildings situated within the southern section of the parcel, with lower, subterranian parking levels. Typical cut and fill grading operations would also generate relatively large pads for single-story commercial structures at the northwest corner of La Costa Avenue and Rancho Santa Fe Road and along the eastern project boundary, as well as an additional 14 level graded pads for future commercial structures with parking lot areas. In addition, two relatively large, sheet-graded pads would be developed in the northeastern corner of the site, near the proposed entrance off Rancho Santa Fe Road, and in the southwest corner, near the proposed entrance off La Costa Avenue. A permanent detention basin with storm drain connections is planned east of the entrance off La Costa Avenue. Background topography presented in the referenced plans indicates that graded (cut) slopes exist along the southern site boundary with La Costa Avenue.

Based upon future elevations provided on the development plan (O'Day, 2001), grading is planned to generate maximum cut depths on the order of 25± feet (subterranian parking levels). Graded cut slopes are planned at gradients of 2:1 (horizontal to vertical) or less. Maximum thickness of fills are planned on the order of 35± feet (south central canyon fill). Graded fill slopes are planned at gradients of 2:1 (horizontal to vertical) or less.

It is anticipated that the commercial building(s) with be concrete tilt-up construction with standard continuous spread footings and column footings. Foundation loads are anticipated to be typical for this type of construction. Underground utilities with associated infrastructure, including asphalt pavement with concrete curb, gutter and sidewalks are also anticipated.



Base Map: Rancho Santa Fe Quadrangle, California--San Diego Co., 7.5 Minute Series (Topographic), 1968 (photorevised 1983), USGS, 1"=2000'



Base Map: The Thomas Guide San Diego County 2001 Digital Edition, by Thomas Bros. Maps, 1"=792'

GeoSoils, Inc.

W.O. 2938-A2-SC

SITE LOCATION MAP

Figure 1

N

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on our review of the above referenced geotechnical reports and plans, it is our opinion that the project is feasible from a geologic and geotechnical viewpoint. The conclusions and recommendations contained in the referenced reports (by GSI) remain pertinent and applicable unless specifically superseded herein.

Bedrock underlying the majority of this parcel consists of sandstone and claystone bedrock of the Delmar Formation, with alluvial soils in the canyon bottoms and artificial fill materials locally existing along La Costa Avenue and Santiago Peak Volcanics encountered within the eastern quarter of the site. Quantities of dumped fill materials also exist within the western portion of the property. Excavations in the Delmar Formation, which will locally encounter well-cemented shell beds, can likely be achieved to the proposed depths with conventional heavy earth moving equipment. Excavations to achieve the subterranean parking levels may likely encountered interbedded sandstone and claystone beds, which will require subsurface drainage. The initial rock hardness study (GSI, 1990) indicated that blasting will likely be necessary at depths on the order of 2-5± feet in excavations exposing volcanic/metavolcanic bedrock.

Recommendations

Removals of existing earth materials considered unsuitable for support of settlement sensitive property improvements should include topsoil, alluvium, and undocumented fill materials. Generally, removal depths over undisturbed areas of the site are estimated to be on the order of 1½± to 4± feet. Removals of stockpiled fill materials within the western portion of the site are typically 1± to 3± feet. Removals of alluvium in canyons is on the order of 5± to 6± feet. Overall, removal depths should be estimated from the test pit and boring logs provided in the initial soils report by this office (GSI, 1990).

EARTHWORK RECOMMENDATIONS

Site grading should be performed in accordance with the minimum standards of the City of Carlsbad, the Uniform Building Code (latest edition) and the grading guidelines presented in the appendix of the above referenced report (GSI, 2000), except where specifically superseded herein. When code references are not equivalent, the more stringent code should be followed.

During earthwork construction, all site preparation and the general grading procedures of the contractor should be observed and the fill selectively tested by a representative(s) of GSI. If unusual or unexpected conditions are exposed in the field, they should be reviewed by this office and if warranted, modified and/or additional recommendations will be offered.

All applicable requirements of local and national construction and general industry safety orders, the Occupational Safety and Health Act, and the Construction Safety Act should be met.

The preliminary engineering and geologic analyses performed, and the recommendations presented herein and in the referenced reports have been completed using the information provided. In the event that the information concerning proposed development is not correct, or any changes in site design are made, the conclusions and recommendations contained in this report shall not be considered valid unless the changes are reviewed, and the recommendations presented herein are modified or approved in writing by this office.

From a geotechnical standpoint, the most primary geotechnical concerns with respect to the proposed development is the onsite disposal of volcanic/metavolcanic bedrock from other areas of the planned development as a whole relative to planned onsite improvements, the stabilization and/or buttressing of existing cut slopes along La Costa Avenue, mitigation of the potential adverse effects of highly expansive claystone bedrock near finish grade surfaces, and the construction and drainage of the subterranean parking areas. Preliminary recommendations are provided below.

Rock Disposal

During the course of grading within other areas of La Costa Town Center development, hard and dense volcanic/metavolcanic bedrock will be encountered which will require disposal onsite. Overall, volcanic/metavolcanic bedrock materials generated are anticipated to be of varying dimensions. For the purpose of this review report, the materials may be described as either 12 inches or less, greater than 12 and less than 36 inches, and greater than 36 inches. These three categories set the basic dimensions for where and how the materials are to be placed. Rock disposal areas within the southern portion of the site should be developed in the early stages of grading to allow for maximum usage. Specific recommendations are provided in the above referenced report (GSI, 2001).

Remedial Earthwork - Lot Capping and Cut/fill Transitions

General Guidelines

For more uniform foundation support conditions as well as to facilitate subdrainage, trenching and future improvements, and decrease the adverse affects of highly expansive claystone bedrock, future building pad sites exposing a cut\fill transition with sandstone bedrock should be capped with a minimum 3-foot thick fill blanket utilizing low expansive materials. Rock fragments in the fill cap should be less than 8-inches in one dimension. Highly expansive materials (i.e., claystone derived fill materials) should not be placed within seven (7) feet of finish grade, if feasible; otherwise, foundation designs may need

revision. Cut lots exposing uniform, low expansive sandstone bedrock, should provide a suitable foundation support.

Care should be taken to avoid placing highly expansive soils or oversized rocky materials within 3 feet of finish grade. Areas, where proposed fills are less than three (3) feet thick, should be overexcavated and/or reprocessed in order to provide the recommended minimum fill cap thickness. For uniform support, the cut portion of building pads should be over excavated to a minimum depth of three (3) feet below proposed pad grade or 1/3(D), where (D) is the maximum fill depth beneath the foundation system for the structure, whichever is greater. Once the overexcavation is completed, the exposed bottom should be scarified to a minimum depth of eight (8) inches (if feasible), moisture conditioned and compacted to a minimum 90 percent relative compaction. Overexcavations should be completed for a minimum lateral distance of 5 feet beyond the lot or below a 1:1 projection down and away from the exterior foundation elements to the elevation of suitable material, whichever is greater. To limit the potential for ponding beneath the fill cap, GSI also recommends that over excavation occurs laterally beyond the building envelope boundary into the street section.

The subgrade surface between fill caps and the underlying dense bedrock should be designed to drain away from foundations at a one percent gradient toward streets and/or subdrains that exceed this depth. If not feasible, additional subdrainage may be needed. This should be further evaluated in the field during grading.

GRADED SLOPES

The following items are significant factors affecting site development. These items are further discussed below:

1. Claystones present on the southern portion of the site (near La Costa Avenue) exhibit west and southerly bedding orientations which would require stabilization fills in western and southern facing slopes.

2. The need for subdrains in canyons, stabilizations/buttress fill slopes, and possibly along the claystone/sandstone bedrock contacts where buried by fill.

Fill Slopes

The highest proposed fill slope is approximately 40± feet high and planned at a gradient of 2:1. This slope, as well as other large fill slopes ranging from 15± to 40± feet in height are to be constructed along the southern perimeter of the property.

Typical keyways for interior slopes less than 20 feet in height are anticipated to be on the order of 12± feet wide and 2 feet in depth, when excavated into sandstone or volcanic

rock. Typical keyways for interior slopes less than 20 feet in height are anticipated to be roughly 15± feet wide and 4 feet in depth, when excavated into claystone bedrock. Keys for perimeter fill slopes along La Costa Avenue would require larger (deeper and wider) keys, due to proposed heights and claystones that are anticipated to be encountered in the keys. For example, perimeter fill slopes will require a key roughly 25 feet wide and 7 feet in depth for slope heights over 20 feet. Perimeter slope keys exposing volcanic rock are anticipated to be 15± feet wide and a minimum of 3 feet into dense bedrock. Typical stabilization type backdrains would be recommended for all perimeter fill slope keys.

Cut Slopes

Cut slopes are designed at gradients of 2:1 or flatter. The highest cut slope is approximately 25± foot high. Cut slopes from 15± to 25± feet in height either exist or are proposed in the north and south portions of the development.

Generally, sedimentary bedrock units exhibit gentle (2 to 5± degree) dips to the west and southwest. Stabilization of westerly and southwesterly facing cut slopes exposing sedimentary rock is anticipated. Specifically, existing cut slopes on the north side of La Costa Avenue are anticipated to require stabilization due to adverse bedding planes and exposure of a claystone or sandstone/claystone contact.

Cut slopes exposing the contact between sedimentary and volcanic bedrock may also require stabilization. The slope descending from the proposed alignment of Rancho Santa Fe Road is anticipated to require stabilization. Typically, stabilization fills should be a consistent width of at least 15 feet from top to bottom. Stabilization fills should be provided with backdrainage as presented in the referenced report (GSI, 2000).

Cut slopes exposing volcanic bedrock are not anticipated to require buttressing or stabilization, unless continuous fractures or shears are encountered. Also, overblasting can weaken the rock material, necessitating stabilization.

All cut slopes should be mapped by a geologist from this office during grading to allow for amendments to recommendations, should exposed conditions warrant alteration of the design on stabilization.

Subdrainage

Placement of subdrains should be evaluated during grading; however, subdrains should be anticipated in all canyon cleanouts and stabilization/buttress fill slopes exceeding 8 feet in height prior to placing fill. Drains are also anticipated in all perimeter fill slope keyways. All drains should be observed by a geologist from this office during grading to allow for amendments to recommendations, should exposed conditions warrant alteration of the design on stabilization.

Due to the potential for groundwater accumulation and migration along sandstone/claystone contacts, drains may be recommended along this contact to drain the impermeable claystone. Subdrains should be constructed in accordance with designs presented in the referenced report (GSI, 2000). Placement should be dependent upon conditions exposed during grading.

Detention/Desilting Basins

Review of the mass grading plans indicates that a basin will be constructed on the southern site boundary, in close proximity to fill slopes. It is our understanding that this basin is a permanent structure. We recommend, therefore, that the detention/desilting basin be lined with either concrete or other impermeable material to hinder the migration of water in the subsurface and to decrease the potential for erosion.

PLAN REVIEW

Project grading plans should be reviewed by this office as they become available. Based on our review, supplemental recommendations and further geotechnical studies specific to the proposed grading configuration(s) will likely be recommended. Further field work may be required.

LIMITATIONS

The materials observed on the project site and the referenced reports reviewed are believed to be generally representative of the area; however, soil and bedrock materials vary in character between excavations and natural outcrops or conditions exposed during mass grading. site conditions may vary due to seasonal changes or other factors. GSI assumes no responsibility or liability for work, testing or recommendations performed or provided by others. The scope of work was performed within the limits of a budget. Inasmuch as our study is based upon the site materials observed, selective laboratory testing and engineering analysis, the conclusion and recommendations are professional opinions. These opinions have been derived in accordance with current standards of practice, and no warranty is expressed or implied. Standards of practice are subject to change with time.

The opportunity to be of service is sincerely appreciated. If you should have any questions, please do not hesitate to contact the undersigned at 760/438-3155.

Respectfully submitted,

GeoSoils, Inc.

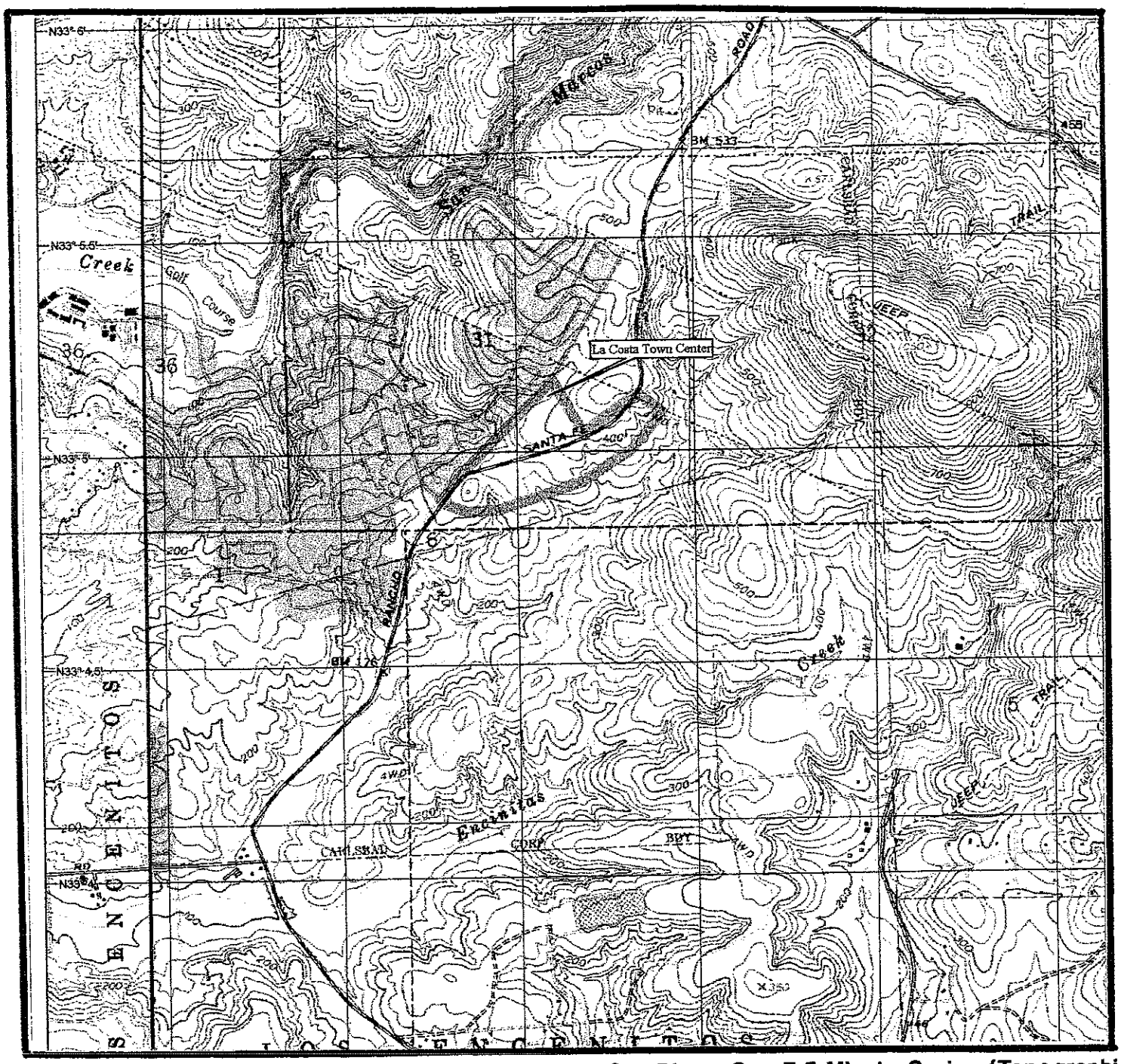
Edward P. Lump
Engineering Geologist, CEG 1924

Reviewed by:

David W. Skelly
Civil Engineer, RCE 47857

EPL/JPF/DWS/mo

Distribution: (12) Addressee



Base Map: Rancho Santa Fe Quadrangle, California--San Diego Co., 7.5 Minute Series (Topographic), 1968 (photo revised 1983), by USGS, 1"=2000'

0 1/2 1

Scale Miles

N

GeoSoils, Inc.

W.O. 2938-A-SC

SITE LOCATION MAP

Figure 1

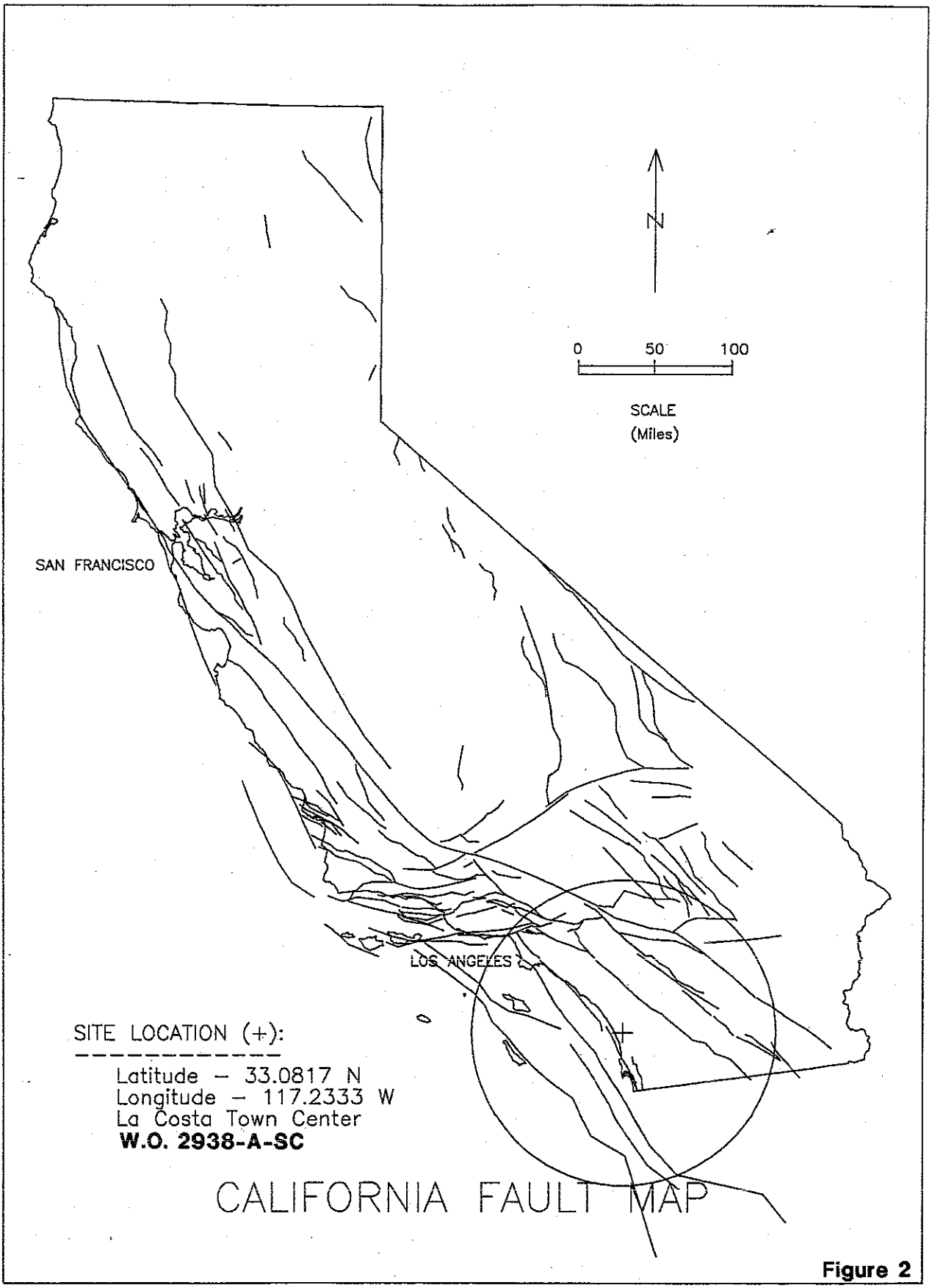

N
0
50
100
SCALE
(Miles)
SAN FRANCISCO
LOS ANGELES
SITE LOCATION (+):
Latitude – 33.0817 N
Longitude – 117.2333 W
La Costa Town Center
W.O. 2938-A-SC
CALIFORNIA FAULT MAP

Figure 2

MEMO TO: Mira Cook, Cotton Bridges Associates
FROM: Robert Olsen, P&D Consultants
DATE: March 28, 2003
RE: Geotechnical Study Review – La Costa Town Square EIR

REFERENCES:

GeoSoils, Inc., "Review of DRAFT Tentative Map, La Costa Town Center – Commercial Area East of Rancho Santa Fe Road", February 21, 2000: for Red Crow Properties, Inc.

GeoSoils, Inc., "Update Preliminary Geotechnical Report, La Costa Town Center", October 20, 2000: for Red Crow Properties, Inc.

GeoSoils, Inc., "Review of Tentative Map for La Costa Town Center – Residential", March 6, 2001: for La Costa Town Center, LLC.

GeoSoils, Inc., "Review of Site Development Plan, La Costa Town Center – Commercial Area South of Rancho Santa Fe Road", March 6, 2001: for La Costa Town Center, LLC.

We have reviewed the above reports and conclude that the work described and the recommendations contained in the reports appears to be appropriate for the scope and purpose set forth. No modifications or additions to the reports appears to be necessary.

From an environmental standpoint, it should be noted that the reports mention the presence of dumped fill materials in the western portion of the commercial area. The origin of the dumped fill is not stated. While it is unlikely that this material poses an environmental concern, we recommend that if any indications of possible contamination (such as stained soil) are noted during excavation, grading or other earthwork on the site, samples be collected and analyzed to assess possible impacts to the soil.